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SOME OBSERVATIONS ON AMPHIBIA AT AND NEAR LAS VEGAS, NEW MEXICO

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The summer of 1940 (June 6 to August 25) afforded opportunity for the study of amphibians and reptiles in and about Las Vegas, San Miguel County, New Mexico. Field trips were taken almost daily; pools, ponds, and streams investigated at every opportunity, for the presence of tadpoles; and several breeding congresses of Amphibia observed. Representative collections of the herpetological fauna were made, tadpoles of several species of Anura were reared and studied in the laboratory, and copeous notes taken concerning ecological relations and habitats. Specimens have been deposited in the University of Oklahoma Museum of Zoology.

Las Vegas is located in the Valley of Gallinas Creek, a tributary of the Pecos River, in the short-grass plains. To the north and west, however, the elevation increases rapidly to the Aspen Zone of the Sangre de Christo Mountains within twenty miles up the Gallinas Valley. The elevation at Las Vegas is approximately 6,400 feet; at the edge of the Transition Zone, seven miles northwest of the city, it is 6,767 feet; and the Aspen Zone occurs at about 8,000 feet. The greater part of the rainfall occurs in July and August (mean over a period of seventy years, just over three inches for each of these months). From late June on through the summer, afternoon and evening showers are frequent, a circumstance which makes the dry hills and mesas of the region suitable habitats for some of the nocturnal, terrestrial Amphibia. Mean temperatures for June, July, and August are given by the U. S. Weather Bureau as 68.6, 67.1, and 60.7° F., respectively. It is a region of warm days and cool nights during the summer.

(1) Contribution from the Department of Zoology, University of Oklahoma, No. 231.

Possible breeding sites for Amphibia in this region include (1) permanent streams (principally the Gallinas and its tributary, the Arroyo de Pecos, the former passing through the center of the city, the latter skirting Las Vegas on the East); (2) irrigation ditches, of which one large one and many small ones occur; (3) ponds, formed by dams across streams, holding water for irrigation; (4) cattle-tanks in short-grass pastures; (5) temporary pools and ditches; (6) seepage pools from irrigation ditches, especially on the sides of mesas; (7) ponds and pools formed in shallow sandstone quarries on the hillsides just south of Romeroville, some seven miles south of Las Vegas; (8) beaver ponds in the Aspen Zone of the mountains, especially in the upper reaches of the Gallinas Valley; and (9) Alpine pools, formed by showers and melting snow, in the higher altitudes to the north. In most of these, the water is muddy with suspensions of a gray clay, some of which appears to be in a colloidal condition. In the beaver ponds, in very few of the temporary pools, and in seepage pools, the water may be temporarily or permanently clear. In the Alpine pools and beaver ponds, the water is always clear. In the lower reaches of the streams and in the pools formed by them here, turbidity depends essentially upon the violence of the local or mountain rains, since after heavy rainfall the runoff from the steep, sparsely vegetated slopes is very fast.

AMPHIBIA OBSERVED

(1) **Ambystoma tigrinum mavortium** (Baird). One adult was collected from wet pavement adjacent to a muddy temporary pond, one mile north of Las Vegas at night in June; another was taken in the basement of a house in Las Vegas in July. Larvae were numerous in muddy temporary pools of large extent in and near Las Vegas in June and July and in clear quarry-pools most of the summer. They were also found in numbers in alpine pools near the snow-line at about 11,000 feet elevation near the Taos County line, some forty miles north of Las Vegas. Those in the quarry-pools were of various sizes but those in the temporary and alpine pools were small and individuals varied but little in length. It seems probable that some specimens in this region are paedogenic, but the collection of adults proves that others are not.

(2) **Bufo woodhousii woodhousii** (Girard). The Rocky Mountain toad is almost certainly the only Bufo in the region. At least, under conditions of moisture and temperature known to be the most favorable for other species in Oklahoma (Bragg, 1940, 1940a, 1940b) none were found even with thorough search. Neither were tadpoles

of other species present at any time during the summer in any of the waters of the region.

B. w. woodhousii is very abundant all about Las Vegas. They were especially prevalent in the valley of the Gallinas at 6,767 feet elevation and below and in the valley of the Arroyo de Pecos within the city limits; but they also occurred high on the short-grass mesas and on the wooded mountain sides both at Montezuma and in Taos County to the north. Considering their prevalence in such situations in Oklahoma (Bragg, 1940a), it is interesting that none were ever found under street-lights at Las Vegas although actively searched for at several times, when they were known to be out. Since there was a relative scarcity of insects frequenting lights here as compared with Oklahoma, it seems proabbly that whenever these toads are attracted to streetlights, it is the prevalence of food rather than the presence of the lights *per se* which attracts them. These toads also feed abundantly among the pines on the steep hillsides at Montezuma (in the edge of the Transition Zone). Since few of them were found here before late June, but were found almost every night thereafter when looked for, it seems probable that the frequent afternoon showers at this season provided sufficient moisture on the otherwise dry hills.

It is probably well to note that specimens were brought to me from Taos County and from the valley of the Rio Grande near Chimayo, Rio Arriba County, the latter collected by Ezequiel Sandoval, one of my students.

The breeding habits in this habitat differ somewhat from those of the same species in Oklahoma (Bragg, 1940a). Many tadpoles were present in flowing streams upon my arrival in the region in June. They were especially abundant in the Gallinas both at Las Vegas and at Montezuma, six miles to the northwest, as well as in the Arroyo de Pecos at the eastern edge of the city. In all of these locations they occurred only in the flatter areas of the stream beds where the water was flowing with a gentle current. They were not found in spring-fed pools on the flood plains of these streams adjacent to the selected breeding sites in the main streams themselves. No tadpoles were found at any time in the muddy cattle tanks in the short-grass pastures of the region, although, basing judgment upon knowledge of the habits of *B. w. woodhousii* in Oklahoma, these were the first places investigated. Late in August, several young tadpoles were taken from shallow, clear water, grassy quarry-pools south of Romeroville. Judging from the size ranges, these had come from three clutches of eggs laid at different times, two of them in one pool,

the other in an adjacent pool. Other than the frequent light showers, there had been no rain since August 6, and the tadpoles were too small to have been produced on or near this date. Males were heard calling all along irrigation ditches as well as in the Gallinas during several nights in June when there had been no significant rain. On the other hand, none were seen or hard about suitable breeding sites after an 0.80 inch rain on July 12 or after heavy rain on August 5 and 6, both of which brought out Scaphiopus in large numbers (see beyond). *B. w. woodhousii* was never found breeding, nor any evidence of its having bred, in roadside ditches in this region.

These observations confirm two conclusions drawn from a study of these toads in Oklahoma (Bragg, 1940a); (1) that they breed more or less independently of rain and (2) that this is a very adjustable and versatile species whose habits are not so fixed that they cannot be changed considerably in adaptation to various habitats.

(3) **Pseudacris triseriata** Wied. This little hylid was found on one night only, breeding in considerable numbers in grassy, clear-water, shallow pools after the rain of 2.04 inches on August 5 and 6. Many males, a few females, and one clasping pair were taken in one place on the north edge of the city, a very few from the edge of another flooded area nearby; and one calling male from an overflow of a ditch four miles to the south. The clasping pair produced a few eggs in the laboratory but these did not develop. Thorough sampling of these pools with a dipnet at two different times later failed to reveal tadpoles. It seems probable that, of the many presumably produced, most fell prey to the predaceous larvae of *Scaphiopus bombifrons* which were very numerous in the pools.

(4) **Scaphiopus hammondii** Baird. I wish to emphasize that the western spadefoot occurs abundantly about Las Vegas. It is not limited to California and areas immediately adjacent as implied by Stejneger and Barbour (1939). It bred twice during the summer, first during the evening of July 12 after a downpour of 0.80 inch in one-half hour late in the afternoon and again, on the night of August 6, after just over two inches of rain. Both times, many eggs were laid and tadpoles developed in many pools, every one of them muddy and temporary in nature.

The voice of this species has been adequately described by Ortenburger (1924) as like the loud purr of a cat but with the metallic sound of grinding gears. It is quite different from that of the closely related *S. bombifrons* and any experienced person upon hearing the two species calling together could not possibly mistake the one for the other. The

reactions of the males in securing mates also differ from those of *S. bombifrons*. According to Trowbridge and Trowbridge, 1937, (and often confirmed by my own observations), the male of the latter species calls with little moving about, apparently depending upon the call to attract the female. In contrast, the male of *S. hammondii* swims actively while calling (cf. Ortenburger, 1924) and investigates any other spadefoot that comes near. Ten different times I watched two males swim actively toward each other, meet head on and struggle for the clasping position. In each case, when one has been successful, the other uttered its breeding cry within a few seconds, whereupon it was released immediately. Since none were released before uttering the call, it seems probable that voice plays a part in sex-recognition in this species. I was not successful in seeing a mating between a female and male.

These differences in the calls and in the mating behavior confirm the results of Smith (1934) and of Tanner (1939) who concluded, principally upon differences in the bony structure at the top of the head, that *S. hammondii* and *S. bombifrons* are specifically distinct. The specific status of these two forms is further confirmed by the constant differences in their tadpoles (Smith, 1934; Bragg, 1941), those of *hammondii* having a prominent beak and notch in the jaws and overdeveloped jaw-muscles, whereas those of *S. bombifrons* lack these structures.

(5) **Scaphiopus bombifrons** (Cope). The plains spadefoot appeared in numbers, breeding in all sorts of temporary pools of both muddy and clear water, during and after the rains already mentioned in July and August. Whereas *S. hammondii* appeared only upon the nights immediately following the rains. *S. bombifrons* called in diminishing numbers for two nights after the rain in July and for three nights in August. Most of the eggs were laid during the first night in each case, however. A small chorus was also heard and individuals seen during the afternoon of August 6 in a deep roily ditch wherein eggs had been laid during the rain the night before.

These facts do not support the common idea that *S. bombifrons* appears but once during a season to breed (cf. Trowbridge and Trowbridge, 1937); and it adds one more to the comparatively few records of these spadefoots having breeding activities in the daytime.

Breeding of both species of spadefoots was observed in many different pools. Some of these contained only *S. bombifrons*, others had only or mostly *S. hammondii*, and still others had about equal num-

bers of each species. I could find no probable reason why this should be so.

In one pool which was very extensive but exceptionally shallow and very muddy, *Scaphiopus bombifrons* bred alone both in July and in August (determined not only by calling males but also by the tadpoles later collected). The eggs produced here in July were not seen but those laid in August were produced in an exceptional manner. Each egg in more than fifty masses found was on a stalk of jelly almost exactly like those figured by Ortenburger (1924) for the eggs of *S. hammondii* in Arizona, except that the egg-masses were smaller. There were often as few as ten or twelve eggs in one mass and seldom more than thirty, the masses close together near the bank and fixed to very low vegetation at the edge of the water. Each egg was attached separately to a plant so that the stalk did not occur on the edge of a jelly-mass as is indicated by Wright and Wright (1933) that they sometimes may be. This is probably the result of the smallness of the masses produced. Since other small masses of eggs of this species have been found which did not have stalks, both in New Mexico and in Oklahoma, and since no eggs observed in other pools have had this appearance, it seems probable that the stalked eggs were produced as a result of some factor or factors in the environment rather than some property intrinsic to the organisms. I have no idea as to what this factor may be; but it should be noted that this pool was very much more shallow (nowhere more than two to four inches deep) than I have ever before seen used by *S. bombifrons* for breeding.

As was observed by Gilmore (1924) for one of them, tadpoles of both *S. bombifrons* and *S. hammondii* vary much in developmental rates, even in the same pool. They also have an independent difference in average size at the same age in different pools. The variation in size of individuals in a single pool is more marked in *S. hammondii* but the difference in individual sizes in any two pools is more noticeable in *S. bombifrons*. Seventy-one tadpoles of the latter species from one pool varied between 13.0 and 39.0 mm. in total length about an average of 27.4 mm., whereas thirty-five of the same age from another pool were just entering metamorphosis at an average length of 45.6 mm. with a range of 42 to 51 mm. Since it was noted that, in general, the deeper the pools, the smaller the tadpoles, a temperature factor may explain the differences of average sizes of tadpoles of *S. bombifrons* taken at the same age from different pools. This will not explain the individual variations noted in the same pools for this species

nor the much greater variations noted for *S. hammondii,* some individuals of which have a developmental rate so fast, when compared with that of their sisters of the same age and in the same pool, as to be truly remarkable.

In most pools observed carefully, the numbers of tadpoles of *S. hammondii* (but not of *S. bombifrons*) were comparatively fewer than expected on the bases of calling males previously noted and of eggs seen. Because of this and also because tadpoles of *S. hammondii* are known to be cannibalistic, I am inclined to interpret the individual differences in developmental rates as an adaptation, some individuals forging ahead of their fellows in development and feeding upon them. I have no direct evidence that this is the case, however, and I have no idea as to how such favored individuals might be produced.

Twenty-one larvae of *S. bombifrons* were reared through metamorphosis and kept for about three weeks in a pail of moist sand to note their behavior, especially as regards feeding. They were fed daily (often several times a day) upon small insects and spiders. Their reactions and food were essentially as described by Trowbridge and Trowbridge (1937), with the following exceptions and additions. They were often out in the daytime and some individuals burrowed only when direct sunlight fell upon them or when the surface of the sand was allowed to become dry. In the early morning, nearly all would be out. In late afternoon, a few of the larger individuals were always in evidence. In feeding, some were more aggressive than others and these grew at a faster rate. The following types of organisms were eaten at least once (some many times): gnats, small flies, small ants of several species, (large ones were offered but never eaten), thrips, collembolans, leaf-hoppers, aphids, several types of small beetles, crab-spiders, and other small spiders. Individuals of a species of small black ant were once taken by each of two of the larger toads, whereupon the toads hopped frantically about, clawing at their mouths, and thereafter refused to attack this insect. These small toads gave no evidence of negative phototaxis but remained active and feeding under an electric lamp. This observation is like that of Trowbridge and Trowbridge (1937) and differs from the findings of Smith (1934). However, as the Trowbridges noted, it does not follow that the behavior in captivity necessarily is the same as in nature.

(6) **Rana pipiens pipiens** (Schreber). The common leopard frog was the only Rana found in the region. It was very abundant along the water-courses and around all of the larger temporary pools and ditches to an elevation of at least 6,800 feet; but neither it nor

its tadpoles occurred in and about the beaver ponds in the higher reaches of the Gallinas Valley, nor was it found in the alpine pools higher in the mountains. Most of its tadpoles were found in the permanent water of the region, principally because its breeding season had passed before the temporary pools had formed during the present season. Its tadpoles were found in one shallow quarry-pool, however. One adult specimen and several larvae, were presented to me from Chimayo, Rio Arriba County, by their collector, Mr. Ezequiel Sandoval.

In view of the question as to how many species of frogs of the *pipiens* group should be recognized in North America, the following characteristics of this form may be of interest: This frog had already bred upon my arrival in June, its tadpoles metamorphosing from late June to mid-July. I found no real evidence of its breeding after June 6 although one mated pair was seen on the bank of a temporary pool during a warm afternoon in mid-August. As contrasted with the common leopard frog of central Oklahoma, it did not call after the rains in July and August while Scaphiopus was breeding, as could have been expected of the Oklahoma form; it was relatively easy to catch by hand in the daytime, something which is decidedly not true of the Oklahoma form; and it seldom emitted a call as it plunged to the water when alarmed, something very characteristic of the common frog of Oklahoma. Structurally, it is a short-headed (or at least not a long-headed) type, and it does not usually have the white spot in the center of the tympanum, a characteristic of its Oklahoma counterpart.

While differences in characteristic behavior are of no help to a taxonomic worker with a series of alcoholic specimens before him, these differences should be taken into account whenever possible. After observing the two forms in the field, I feel certain that the frog about Las Vegas, New Mexico is very similar to, if not identical with, the grass-frog of New England (*Rana brachycephala* of the recent checklist) and the leopard frog of Wisconsin and different from that of Oklahoma which I call *Rana sphenocephala* (Cope).

SUMMARY

In summary, one Bufo, one Rana, one Pseudacris, two Scaphiopus and one Ambystoma apparently constitute the amphibian fauna of the Las Vegas region. The Bufo and Rana typically breed in the springtime, the Rana before the Bufo, if one may judge from this one sea-

son's observations. The Pseudacris and both species of Scaphiopus breed following rains later.

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